

## WHAT IS CLAIMED IS:

1           1.       A coupling device for connecting a filter element to a fluid conduit,  
2 comprising:

3               a male coupling secured to one of said fluid conduit and said filter element,  
4 said male coupling having at least two radially projecting tabs; and

5               a polymeric female coupling engaged with said male coupling for securing  
6 said filter element on said fluid conduit, said female coupling having lands for  
7 receiving said tabs,

8               said male and female couplings each having a passageway for fluid, said  
9 passageways defining an axial direction,

10              each said tab being configured for distributing an axial force generally  
11 throughout said tab and laterally relative said axial direction so that either of said land  
12 being forced against said tab or said tab being forced against said land does not  
13 damage said female coupling and said filter element remains secured to said fluid  
14 conduit.

1           2.       The coupling device according to claim 1, wherein said male coupling  
2 is directly secured to said fluid conduit and is stainless steel.

1           3.       The coupling device according to claim 1, wherein said lands are  
2 generally flat and said tabs have generally flat surfaces for engaging said lands, said  
3 flat surfaces having predetermined surface areas for distributing said axial force  
4 throughout said flat surfaces.

1           4.     The coupling device according to claim 3, wherein said male coupling  
2 defines an outer cylindrical surface having a circumference, and wherein said tabs are  
3 generally elongated along said circumference.

1           5.     The coupling device according to claim 3, wherein said flat surfaces  
2 are generally normal to said axial direction.

1           6.     The coupling device according to claim 1, wherein said lands of said  
female coupling generally extend in planes perpendicular to said axial direction.

2           7.     The coupling device according to claim 1, wherein said tabs and said  
3 lands are configured and disposed on said female and male couplings so that one said  
4 coupling is stationary and the other said coupling is rotated at most approximately 1/6  
5 of a full rotation on said stationary coupling to fully engage said lands on said tabs.

1           8.     The coupling device according to claim 1, wherein said male coupling  
2 has a first portion with an outer surface having a first outer diameter configured for  
3 fitting within said female coupling and a second portion configured for securing onto  
4 said fluid conduit and having a second outer diameter larger than said first outer  
5 diameter, and a ledge connecting said first and second outer diameters; and

6           the coupling device further comprising a biasing means disposed on said ledge  
7 for biasing said land toward said tab,

8           wherein said axial force is at least partially formed by said biasing means.

1           9.     The coupling device according to claim 8, wherein said female  
2 coupling includes a bottom edge, and wherein said biasing means has two opposing  
3 sides and is disposed between said bottom edge and said ledge so that said biasing  
4 means abuts said ledge on one said side and abuts said bottom edge on the other said  
5 side.

1           10.    The coupling device according to claim 8, wherein said biasing means  
2 is a wavy washer mounted around said first portion and on said ledge.

1           11.    The coupling device according to claim 1, wherein said male coupling  
2 has a first portion with a first surface of rotation, and said female coupling has a  
3 second surface of rotation opposing said first surface of rotation, said surfaces of  
4 rotation defining where said female coupling receives said male coupling; and

5           the coupling device further including a sealing element disposed between said  
6 first and second surfaces of rotation so that unfiltered material cannot enter said fluid  
7 conduit.

1           12.    The coupling device according to claim 11, wherein said sealing  
2 element is an O-ring.

1           13.    A coupling device for connecting a filter element to a fluid conduit,  
2 comprising:

3           a male coupling having at least two radially extending tabs;

4           a polymeric female coupling having a land for engaging each said tab, said  
5 female coupling defining an axis, a circumference and an axially extending access

6 channel continuous with a circumferentially extending land channel for receiving one  
7 of said tabs, wherein said land defines a surface of said land channel, and wherein  
8 said access channel is configured and disposed on said female coupling so that each  
9 said access channel receives one of said tabs, and either said access channels are first  
10 moved axially over said tabs and then said land channel is moved angularly over said  
11 tabs or said tabs are moved axially through said access channels and then moved  
12 angularly through said land channels in order to place said tabs on said lands.

1 14. The coupling device according to claim 13, wherein said male  
coupling is stainless steel, is secured to said fluid conduit, and includes flat mating  
surfaces on said tabs for engaging said lands, and wherein said female coupling is  
secured to said filter element and is configured so that said female coupling must be  
pushed axially toward said male coupling and then rotated to place said tabs in said  
land channels.

2 15. A coupling device for connecting a filter element to a fluid conduit,  
comprising:

3 a first coupling having an exterior surface of rotation and at least two tabs  
4 projecting generally radially from said exterior surface, and defining a passageway for  
5 fluid and defining an axial direction, each said tab having a flat mating surface with a  
6 predetermined surface area for distributing an axial force generally throughout said  
7 mating surface and laterally relative to said axial direction.

1 16. The coupling device according to claim 15, wherein said first coupling  
2 defines an inner core, said tabs not being joined by any crosspiece spanning said core.

1           17.    The coupling device according to claim 15, wherein said tabs are  
2 integrally formed with said exterior surface or welded to said exterior surface.

1           18.    The coupling device according to claim 15, further comprising a  
2 second coupling made of a polymeric material and having generally flat lands for  
3 mating with said tabs of said first coupling.

1           19.    A female coupling for connecting a filter element to a fluid conduit,  
2 comprising:

3           a polymeric body having a land for receiving a projection at a fully secured  
4 position, said female coupling defining an axis, a circumference and an axially  
5 extending access channel continuous with a circumferentially extending land channel,  
6 said land defining a surface of said land channel.

7           20.    The female coupling according to claim 19, wherein said land is flat  
8 and elongated in at an angle to said axial direction for mating with a flat projection.

1           21.    The female coupling according to claim 19, wherein the female  
2 coupling is secured to a filter element and said projection extends from a stainless  
3 steel male coupling secured to said fluid conduit.

1           22.    A coupling device for connecting a filter element to a fluid conduit,  
2 comprising:

3           a polymeric filter-side coupling attached to said filter element;

4 a conduit-side coupling attached to said fluid conduit and engaging said filter-  
5 side coupling;

6 a selected one of said filter-side coupling and said conduit-side coupling  
7 having at least two radially projecting tabs, and the corresponding other said coupling  
8 having lands for receiving said tabs,

9 wherein said filter-side coupling receives an axial force causing said lands and  
10 said tabs to press toward each other, and

11 wherein said filter-side coupling has either said lands or said tabs being  
12 configured for distributing said axial force laterally relative to said axial direction and  
13 generally through out said land or said tab so that said filter-side coupling is not  
14 damaged.

23. A quick-connect coupling device for connecting a filter element to a  
fluid conduit, comprising:

a male coupling having generally radially projecting tabs; and

a polymeric female coupling having lands for mating with said tabs; and

5 means for twisting said filter element onto and engaging said couplings,

6 one of said couplings being part of said filter element, and said couplings  
7 being configured so that said couplings are fully engaged with each other with at most  
8 a single twist of said twisting means without said twisting means releasing and re-  
9 grasping said filter element and without releasing and re-grasping said twisting  
10 means.

1 24. The coupling device according to claim 23, wherein said coupling on  
2 said filter element is turned no more than approximately 1/6 of a single full turn to  
3 fully secure said female coupling to said male coupling.

1           25.     The coupling device according to claim 23, wherein said tabs each  
2           have a flat mating surface with a predetermined surface area for distributing an axial  
3           force throughout said mating surface, said axial force received from said fluid flowing  
4           through said coupling.

1           26.     A method of rapid installment of a filter element on a fluid conduit,  
2           comprising the steps of:

3                   grasping the end of the filter element;

4                   moving the filter element axially for engaging a polymeric female coupling on  
5                   a selected one of the filter element and the fluid conduit with a male coupling on the  
6                   corresponding opposite one of the filter element and the fluid conduit, one of said  
7                   couplings being a part of said filter element; and

8                   twisting the filter element for twisting a selected one of said female coupling  
9                   and said male coupling on said filter element for fully engaging said couplings to each  
10                  other without releasing and re-grasping said filter element.

1           27.     The method of rapid installment according to claim 26, wherein said  
2           twisting step includes twisting said filter element no more than approximately 1/6 to  
3           1/4 of a single full turn to fully engage said couplings.

1           28.     The method of claim 26, and further comprising the step of time-  
2           limiting an exposure of a worker to a toxic environment in which the fluid conduit is  
3           disposed.

1           29.    A coupling device for attaching a filter element to a fluid conduit,  
2 comprising:

3           a male coupling formed around a first axis and having an attached end, a free  
4 end, an exterior side wall between the attached end and the free end, and a hollow  
5 core disposed interiorly of the exterior side wall, a portion of the exterior side wall  
6 adjacent the free end formed as a first surface of rotation, a plurality of tabs extending  
7 outwardly from said portion of the exterior side wall and angularly spaced apart from  
8 each other with respect to the first axis, each tab having an engaging face facing the  
9 attached end, said engaging face having a nonzero width at an angle to the first axis  
10 and subtending a nonzero arc about the first axis, the attached end being attached to a  
11 first pre-selected one of the filter element and the fluid source;

12           a female coupling formed of a polymeric material around a second axis and  
13 having an attached end, a free end, an interior side wall formed between the attached  
14 end and the free end, a portion of the interior side wall adjacent the free end formed  
15 generally as a second surface of rotation matable to the first surface of rotation, a  
16 plurality of access channels formed in the interior side wall from the direction of the  
17 free end of the female coupling and longitudinally extending toward the attached end  
18 thereof, each access channel adapted to receive a respective tab of the male coupling  
19 element and having an end opposite said free end which terminates in a groove  
20 formed in the interior side wall which extends at an angle from the respective access  
21 channel and subtending a predetermined arc with respect to the second axis, a land of  
22 the groove facing the attached end of the female coupling adapted to receive a  
23 respective one of said engaging faces of the tabs, the land having an area, the attached

24 end of the female coupling attached to a second pre-selected one of the filter element  
25 and the fluid conduit; and

26 means for axially biasing the filter element relative to the fluid conduit such  
27 that an axial force is created pushing the filter element away from the fluid conduit,  
28 the axial force being distributed on the areas of the lands and on the engaging faces of  
29 the tabs.